

An Assessment of Tropical Dry-land Forest Management in Africa: What Are Its Lessons ?

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- \$ More than 2 billion people still depend on woodfuel (firewood and charcoal) to satisfy their basic energy needs, and the resulting pressure on natural vegetation cover represents a risk of overexploitation, leading progressively to deforestation, especially for the tropical dry-land forests (TDLF). The impact of TDLF depletion, in particular the consequences for the greenhouse effect, losses in biodiversity, local socioeconomic costs, is a great concern for the international community.
- \$ After almost 20 years of successive failures and step-by-step learning, the promising results obtained with “devolution of forest management to the local communities” in combination with the effects of the gradual but inevitable shifting from woodfuel to alternative fuels, let us expect a better future.
- \$ Forest management by local people has now proved its feasibility and its positive impact on environment and offer new opportunities for poverty alleviation and gender equity in rural areas, obviously at present but also for the future if they succeed in continuing to develop new markets for woodfuel.
- \$ This presentation is based mainly on two discussion papers, both prepared for ESMAP (Energy Sector Management Assistance Program): “*Sustainable Woodfuel Supplies from the Dry Tropical Woodlands*” by Gerald Foley (1998), and “*Dry Tropical Forest Management and Household Energy*” by Michel Matly and myself (1999).

What are tropical dry-land forests

- \$ TDLF cover about 250 million hectares, the bulk of which (64%) are found in Africa (FAO, 1993). They include a large range of vegetation from light scattered scrub through to relatively dense woodland. A comprehensive 1994 World Bank study (Millington and al) classified the natural vegetation cover in sub-Saharan Africa in seven broad categories, of which six are TDLF covering over most of the Continent apart from the Congo basin and few other areas. Generic name of TDLF in the Sahel is savanna. In central and southern Africa, TDLF are broadly referred to as miombo woodland.

See Map from Millington and al, 1994

- \$ A common characteristic of the areas covered by TDLF is their low population density: typically in the range of 5-10 persons per sq km in low rainfall areas (below 600 mm per year) to usually no more than 30 persons per sq km in areas with higher rainfall.

- \$ TDLF exist in a permanent disequilibrium state with significant numbers of dead trees, facing recurring cycles of severe and prolonged droughts followed by periods of higher rainfall. Vegetation is well adapted to these harsh conditions; when the drought is severe, growth may virtually cease. The seeds of many of the tree species are able to survive long dry periods and their regrowth can be surprisingly rapid in areas of apparently complete deserts.

Human impacts on the TDLF: facts and beliefs

- \$ The natural landscape in most of the TDLF areas has been altered irrevocably by human intervention, such as agriculture and pastoralism, commercial woodfuel harvesting and charcoal-making, even traditional hunting and gathering. However, changes in the vegetation cover does not mean its productive capacity has been destroyed.
- \$ Modern research is now undermining some of the most deeply-held beliefs about the evolution of the African landscape and the impact of local people upon it. The possibility that the degraded TDLF landscapes and the effects of human intervention have been completely misinterpreted is now well established: much of the observed degradation can be reversed with proper intervention.
- \$ It is also clear that the widespread tendency to consider the rural population as immature and destructive, and requiring the protective custody of government officials and foreign experts is unfair and incorrect. The fact that rural people may be forced to take short-term measures to survive, this does not mean they are not capable of seeing beyond the immediate present. There are strong local traditions of looking to the long term future in many areas.
- \$ The term deforestation is widely but imprecisely used. According to the FAO definitions, deforestation occurs when there is a reduction of the tree crown cover to less than 10 percent of the area, or when agriculture begins to take place in the area, while forest degradation occurs when the original cover has been reduced but remains above 10 percent. Therefore, alarming FAO deforestation statistics - 2.2 million ha per year on average during the 1980s- do not mean that these areas have been stripped of all their trees and the deserts advance.
- \$ Farming is the major cause of deforestation throughout the developing world, accounting for 90 percent or more of that recorded in most statistics. However, the fact that an area has been converted to agriculture does not necessarily mean it is permanently deforested. First of all, in traditional dry-land agriculture, locally valued trees are generally left in place. Secondly, the area will be abandoned after few years as a fallow, and quickly colonized by woody vegetation from old roots or windblown seeds. If the fallow period is long enough, there is a gradual re-growth of a so-called secondary woodland which, after a while, may be virtually impossible to distinguish from the original. Several observations show that the loss of standing stock due to agriculture clearing could be surprisingly low. The standing stock may even have increased; only a detailed local

assessment will give the correct status information.

- \$ On the other hand, in most areas where the fallow period has been shortened due to land scarcity, it was observed that the increased population resulted in a substantial increase in tree planting, especially for fruit and poles (also providing woodfuel as a byproduct).
- \$ Use of fire. The use of fire was commonly considered as a major cause of forest degradation. However, the effects of fire can appear extremely severe but woodlands tend to recover quite rapidly. This practice -used at least for 2,500 years in Africa- is now recognized as a natural element in the ecology of the dry-land areas and an essential tool in the land-management strategies of the local people, who are usually well able to control it.
- \$ Pastoralism. Breeding cattle, sheep and goats is an important activity for a high proportion of people living in and around TDLF. For a long time, pastoralism was viewed as environmentally destructive. It is gradually being recognized as a critically important element, for the Sahelian ecology and for the survival of its inhabitants. Pastoralists need to be seen as essential actors in any comprehensive management strategy for the TDLF.
- \$ Rural woodfuel harvesting. Most of collection of woodfuel for rural domestic use is carried out by women and children. It is almost entirely outside the cash economy and is often done in association with other activities (coming back from the fields or school, while tending domestic animals, etc). It is now commonly admitted that the overall impact of rural self consumption on the woodland resource base is very limited. Collection generally relies on dead wood; much of the woodfuel comes from fallow areas; levels of consumption decrease and supplementary fuels come into use as soon as woodfuel collection become difficult (rural woodfuel consumption is estimated to range from 250 up to 700 kg per head per year in well-wooded areas). Gerald Foley recommended in its ESMAP discussion paper (1998) : *“When looking at supply prospects in a woodfuel catchment area in the dry tropical woodland areas, it is probably safer to ignore the impact of local woodfuel harvesting completely rather than to aggregate it with urban consumption...”*
- \$ However, rural woodfuel consumption could become a major preoccupation in the future due to the charcoal transition as it has been observed in the Office du Niger area in Mali or in the Mahajanga region in Madagascar, where it was found that rural households increasingly start using charcoal.
- \$ Woodfuel harvesting for urban market supply. The supply of woodfuel for urban markets is usually done by well-established supply chains. For larger cities the bulk of supply is transported by truck, although various means of transportation exist in the smaller cities ranging from long queues of camels, donkey carts and/or bicycles. Such chains are usually dominated by urban wholesale dealers, who, in many case, control the transport system, sometimes with the complicity of politicians and government officials.

See pictures of woodfuel transport

- \$ Urban woodfuel consumption is conventionally credited with huge amounts of deforestation, and frequently given in equivalent of hectares of woodland cleared per year, with the insinuated meaning that these areas are completely lost to the supply system. In practice, the issue is much more complex. While conducting the World Bank Household Energy Study in Niger in 1986, we have identified three distinct harvesting phases in the woodfuel catchment areas of Niamey: first, when woodcutters newly move into an area and take only dead wood; second, they need to cut living trees to complete the load, but the woodland stock remains intact; third, dead wood has disappeared and the woodcutters cut all the sellable trees. In this last phase, the capacity for regeneration is usually not destroyed: woodcutters and charcoal makers in Niger, Burkina Faso, Mali and Senegal all claim to go back to the same area every 7 to 14 years.
- \$ Although woodfuel harvesting for urban markets is of a larger scale, of a more commercial nature, and more concentrated than harvesting for rural consumption, various studies (Zambia, Tanzania, etc.) conclude that woodlands appear to recover relatively well even following harvesting for charcoal production. In addition, woodfuel harvesting for urban markets concern generally less than 1 or 2 percent of the total wooded area of the countries. However, due to selective cutting of the commercially attractive species, without provision for regeneration, there is a real risk of reduced biodiversity,

Successive failures or mitigated successes

- \$ The belief that the developing countries were facing a major “woodfuel crisis” - also called the “other energy crisis” (Eckholm, 1976)- emerged in the mid-1970s, while, at the same time, the industrial world was facing the first oil crisis.
- \$ Then, alarming and sometimes apocalyptic statements followed each other. Among others, a 1978 report from the CILSS and Club du Sahel predicted that “... *in the absence of vigorous action now, much of the Sahel region will have become a desert by the year 2000.*” In 1981, FAO published a map of the woodfuel situation providing dramatic views of an imminent crisis, followed by a report (de Montalembert and Clement, 1983) projecting that 2.4 billion of people will face an acute woodfuel scarcity by the year 2000, and woodfuel “... *will probably no longer play more than a marginal role*” in a growing number of situations. World Bank papers published in 1984 pointing to the accelerating gap between the supply and demand of woodfuel, predicted the more or less complete disappearance of wood supplies in Niger long before the year 2000 (Anderson and Fishwick), and a massive turn to the use of dung for fuel in Ethiopia with dramatic consequences on soil erosion and fertility (Newcombe).
- \$ The consensus regarding the woodfuel crisis has led to large scale development assistance devoted to mitigate the TDLF depletion and stop the desertification effect. Every conceivable activity has been probably proposed. Five main technical responses were developed and implemented in numerous countries: improved cooking stoves,

improved charcoal-making techniques, interfuel substitution, forest plantations, and farm and communities forestry.

§ In practice, most of these activities have failed to reach the intended effect in terms of halting deforestation, although often yielding important socio-economic benefits. The design of these activities has improved progressively as a result of step-by-step learning.

Period	Facts	Technical response	International Community
1970s	First oil crisis Emerging awareness on woodfuel role in satisfying basic energy needs Raising concern about tropical forest depletion Emergence of the “woodfuel crisis”	Single-technique oriented approach Large industrial afforestation programs focused on fast growing species, including irrigated plantations Improved cooking stove and charcoal making technique dissemination programs implemented by governmental institutions Agglo-briquetting of agricultural or agro-industrial wastes	Strong concern resulting in abundant funding
1980s	Failure of large afforestation programs Slow paces of dissemination of improved stoves and charcoal making techniques Progressive shifting towards smaller scale programs requiring local people involvement Taking into account of woodfuel dealers	Village woodlot, afforestation with native species & agroforestry Portable metal & clay stoves for urban dwellers Interfuel substitution with kerosene and LPG Woodfuel supply Master Plans Design of household energy strategies	Massive funding gradually reduced due to increasing lassitude and interrogation
1990s	Growing concern and trend for environment protection Better knowledge and understanding of woodfuel problems	Household energy projects focusing on implementation of strategies Raising role of the private sector Conducive regulation and fiscal framework self-financed implementing agencies Rural woodfuel markets associated with simple woodland management plan	Reduction in financing woodfuel related activities (GTZ, USAID, World Bank, etc.) Growing funding of environment conservation oriented projects
2000s	Awareness of the role of woodfuel projects in poverty alleviation and gender equity	Development of woodfuel rural markets Searching for new markets	??

§ Improved cooking stoves. After the almost total collapse of the first-launched programs for the dissemination of self-built cooking stoves in rural areas (generally made of a mixture of clay and sand), the improved stove activities have been redirected towards the urban areas where people pay for woodfuel. Substantial numbers of improved stoves are already in use in numerous countries and the numbers being sold continue to rise. The

improved *Jiko* in Nairobi (Kenya), the *Lakech* in Addis Abeba (Ethiopia), the *Mitsisty be* in Antananarivo (Madagascar) or the *Rondereza* in Rwanda, all of them charcoal stoves, are samples of success stories.

- \$ In time, such new improved stoves will possibly entirely replace the traditional types in some urban areas, as has already begun in the aforementioned countries. They will benefit their users with a reduction of their expenditure on woodfuel, greater safety and quicker cooking time. On the other hand, their effect on the overall urban woodfuel consumption will probably remain relatively low, below 10 percent according to the few estimates available. The lowest income households tend to use their savings to cook more food.
- \$ Improved charcoal-making techniques. Sporadic attempts to promote improved charcoal-making techniques have been made: for example, steel kilns in Uganda in the 1960s, the Casamance kiln in Senegal in the 1970s and in Rwanda in the late 1980s. Most of the attempts appear to have had any significant enduring impact. Nevertheless, in Rwanda, likely 20 percent of all country's charcoal-makers were trained and more than 60 percent continue to use what they had learnt.
- \$ One of the main cause of the failure of theses programs was that they focus on the energy efficiency, which is of little significance to traditional charcoal makers who operate mostly in areas where the cash cost of wood is zero and wood is available. On the other hand, they may likely adopt techniques which lessen the labor needs without incurring any cash outlays.
- \$ Interfuel substitution. Most urban women interviewed during the household energy surveys we have carried out in various countries (Ethiopia, Chad, Madagascar, Mali, Niger, Senegal) are clear: they do not like to cook with wood, because it is difficult to light, awkward, dangerous for kids, smoky and making red eyes, slow and messy. On the other hand, they generally consider charcoal as a modern fuel that lacks most of these negative effects. The common trend is a progressive voluntary shift from wood to charcoal, then to kerosene, LPG and/or electricity. The full shifting from woodfuel to alternative fuels may be a long process: at first, the new fuels are generally only used for light meals, making tea or warming the feeding bottle, while woodfuels are still used as the main cooking fuel. Then, the use of the alternatives gradually increases. Thus, in a family, two, three or more fuels and a variety of stoves can be used at the same time or alternatively. In Addis Ababa, the medium income families have generally in their kitchen kerosene and LPG stoves, electric *injera* cooker, and a traditional charcoal stove for the traditional coffee preparation.
- \$ A number of countries have attempted to accelerate the shift to alternative fuels. The results are mixed. In Senegal, the *butanisation* program launched in 1974 has taken twenty years and huge amounts of subsidy before the use of LPG in Dakar became significant. The CILSS regional program funded by the European Union to promote LPG

in the Sahel was terminated for lack of results. The attempts of the World Bank's household energy projects to promote kerosene for cooking in Niger and Mali have been undermined by erratic supplies of kerosene stoves. In Ethiopia however, a significant percentage of households now rely on petroleum fuels for their cooking.

- \$ Programs to promote substitutes for woodfuel through subsidies are difficult to administer. They often fail to reach the poor and subsidize better-off families, who are already using the substitutes or likely to shift to it in any event. In the 80s in Haiti, LPG stoves were heavily subsidized. People snapped up the stoves in no-time, but actual LPG consumption did not increase (people thought the stove to be a good deal, but could not afford the fuel cost and intended to wait until fuels prices would drop).
- \$ Forestry plantations. Large state-owned forestry plantations were the first response of the forestry experts and international aid to the woodfuel crisis. The fast-growing tree plantations of several thousands hectares in Burundi, Madagascar, Malawi, Togo and Mali and the attempts of irrigated plantations in Niger are some examples, which, all of them, have failed to be significant suppliers of woodfuel. With high costs of establishment (up to US\$ 2,000 per ha for the irrigated plantations) and maintenance, and much lower yields than expected, the wood produced by this type of plantations could obviously not compete with wood harvested from natural woodlands. This option has been abandoned.
- \$ Farm and community forestry. Numerous projects have been launched to promote tree growing by individuals or community groups. Community forestry showed the highest rates of failure, and has been largely abandoned by the mid 1980s: similar problems were observed as with the forestry plantations (high costs and poor yields) and social problems related especially to the division of work and rewards.
- \$ Farm forestry is a great success in some countries, such as India or Pakistan. In Pakistan, World Bank detailed surveys have shown that on-farm woodfuel production supplies a substantial part of the national woodfuel demand. On the other hand, the majority of projects to promote tree-growing for woodfuel by farmers were failures in TDLF areas in Africa. One could say that this is due to the peasant's common sense: growing trees -that can be an arduous task in arid climates- for woodfuel is just not worth the trouble since substantial quantities of natural woody biomass are generally freely available in the surroundings. Then, in many projects, the emphasis was shifted from woodfuel to "multi-purpose" tree growing.

- \$ Legal and fiscal measures. The belief that charcoal making is a highly inefficient use of wood resources and an agent of deforestation has led to widespread condemnation of the use of charcoal as a domestic fuel. Its use has been banned, for example, in The Gambia and Malawi, and its production was prohibited in the surroundings of Nairobi or by private operators in Ethiopia, without previous appraisal of the feasibility of such rules. The results were counter-productive: these bans made charcoal production illegal but did not stop it, pushing the charcoal makers to operate rapidly and hiding themselves from forest officials, and creating no incentives for the use of improved charcoal-making techniques.
- \$ Few control systems function effectively due to a widespread corruption of forest officials. Nonetheless, some have proved they can function. This was the case at the early beginning of the World Bank household energy project in Niger, when the control-points at the Niamey entrances have effectively controlled about 90 percent of the estimated woodfuel traffic during few months. Then, a long period of political instability has undermined these efforts and the rate of control has fallen down even below its prior level.
- \$ Many projects looked at ways of changing the taxation system to ensure that consumers paid the “true” economic price for their woodfuel. The most commonly chosen approach was to set a “stumpage fee” or tax on woodfuel, which would bring its selling price up to its estimated replacement value. Despite much urging by donor agencies, however, the governments were reluctant to impose price increases on such a basic commodity as woodfuel. Because the tax level remains so small, and largely evaded, woodfuel prices have generally remained below their calculated replacement costs, and simply reflects the costs of harvesting, transport, distribution and dealers’ profits.

Exaggerated woodfuel problem

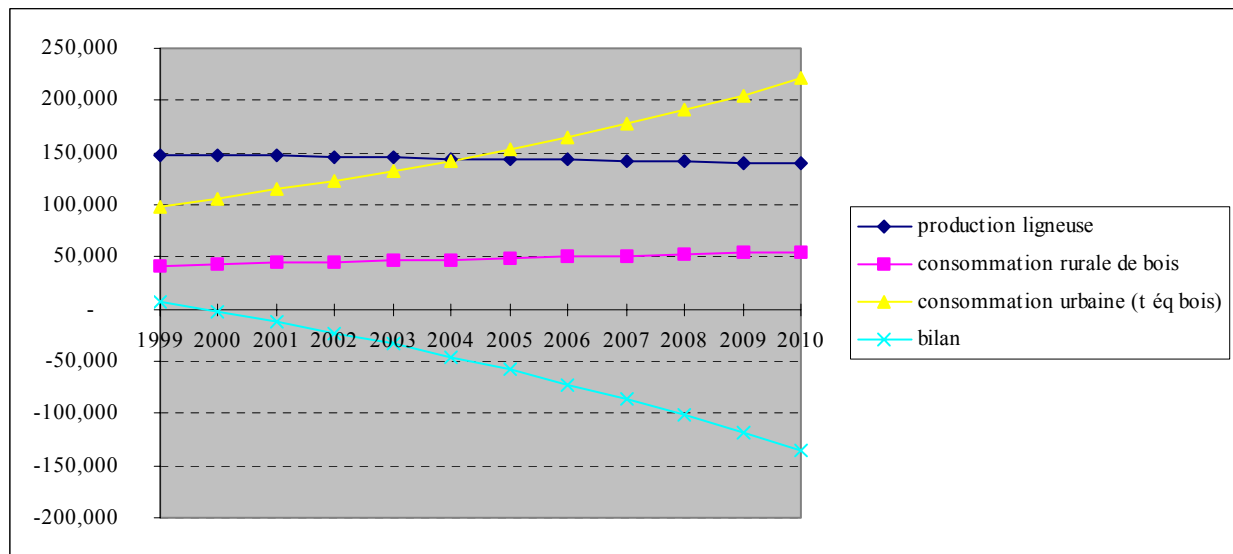
- \$ As everyone knows, fortunately, none of the predictions made in the 1970s on the disappearance of the tropical forests and its dramatic consequences have materialized. With the benefit of twenty years of hindsight, it is easy to see that the woodfuel crisis was greatly exaggerated. The fault for this exaggerated perception lays in the widely used “energy gap” approach.
- \$ The exaggerated vision of an imminent ecological disaster due to woodfuel use has succeeded in drawing the attention of Governments and donor agencies and mobilizing abundant financing. But it has largely prejudiced the interpretation of problems and the design of solutions. It is time to re-interpret the woodfuel problem with a more positive approach: woodfuel supply should be considered as an opportunity for rural communities to earn a sustainable cash income.

Weakness of the “energy-gap” approach

- \$ The basis of the “energy gap” approach is the comparison between woodfuel consumption and the annual yield in the standing stock. It is assumed that when the consumption exceeds the annual yield, there is a decrease in the growing stock which, in turn, leads to a decrease in the annual yield.
- \$ The weakness of the energy gap approach lays in the difficulty in estimating the standing stocks and annual yields of woodfuel, and getting reliable data on consumption and trends, especially regarding the changes in consumption patterns and interfuel substitution.
- \$ Difficulty in estimating and tendency to underestimate standing stocks and yields. The already mentioned 1994 World Bank study emphasizes the high degree of variability and unreliability in the data available on standing stocks and yields. Forest management techniques and measurement methods have been mainly developed for conventional commercial forestry, especially for timber production. Therefore, the foresters have little, if any, experience in measuring the standing volume of the “woody biomass” typically used for woodfuel.
- \$ In the 1980s, mainly estimates of standing stocks included only trees with a trunk diameter of 10 cm or more. While this may be useful for commercial timber, it seriously underestimates the availability of woodfuel, especially that used by rural people. More recent studies incorporate smaller diameters, such as 4 cm.
- \$ Another common practice is to ignore the wood growing in farms and fallow areas, which are often highly significant as sources of woodfuel.
- \$ The hugely influential 1983 FAO study of woodfuel supplies has been based on the sustainable annual yield concept. However, this concept is fraught with difficulty and uncertainty when applied to woodfuel harvesting. A large variety of factors influence the amount of growth from year to year: rainfall, human activity, grazing, removal of tall trees, fire which could clear away excessive growth of grasses may allow trees and shrubs to grow more strongly, but if the burning is too severe, the damage may outweigh the gain.
- \$ Several studies now agree that yields may be considerably higher than has previously been thought. The literature often described woodfuel availability estimates as “conservative”, meaning they are on the low side.
- \$ There is always a strong tendency for investigators to find what they expect, while the most important requirement is that the investigative approach is open-minded. The possibility that the conventional wisdom is incorrect needs to be constantly borne in mind and tested against the available evidence. While participating to an energy assessment in

a Sahelian country in the 1980s, I still remember the fear of my team leader when I told him that, according to available data, there is a large excess of woody resources compared to the woodfuel demand: I had said something “politically incorrect” since the prevailing consensus at that time was that rapid deforestation is occurring leading inevitably to acute woodfuel crisis.

- \$ Difficulty in estimating charcoal transition and interfuel substitution Reliable data on all the important parameters which determine the woodfuel consumption are extremely scarce in most developing countries. Estimates on urban population -subject to accelerated and uncontrolled migration phenomena- are generally questionable. But the major difficulty lays in how to apprehend correctly the changes in woodfuel consumption patterns. Lifestyle and food patterns change, with effects on the per capita consumption. With the expansion of cities making a large proportion of the population to live in ceaselessly more remote suburbs, many workers have no more time to go back home and they take breakfast and lunch in small restaurants. The growing use of pre-process foods save time and fuel.
- \$ In most of urban areas, interfuel substitution is occurring. Charcoal is gradually replacing wood and becoming the major fuel for cooking in numerous cities. In order to underline the inevitable interfuel substitution, one of my colleagues has recently published an article titled “*the death of household fuelwood foretold*” (Matly, 2000). Within the last 10 years, Addis Ababa “has shifted” to kerosene, and Dakar to LPG. Surveys rarely give enough accurate data to simulate this phenomenon, as it would require a substantial amount of work and in-depth sociological investigation.
- \$ High sensitivity. A purely econometric analysis of the energy-gap model show their high sensitivity to hypothesis for TDLF natural yield and woodfuel demand: with slight variations on the figures used, the model can predict either a drastic desertification or a massive natural growth of the standing stocks.

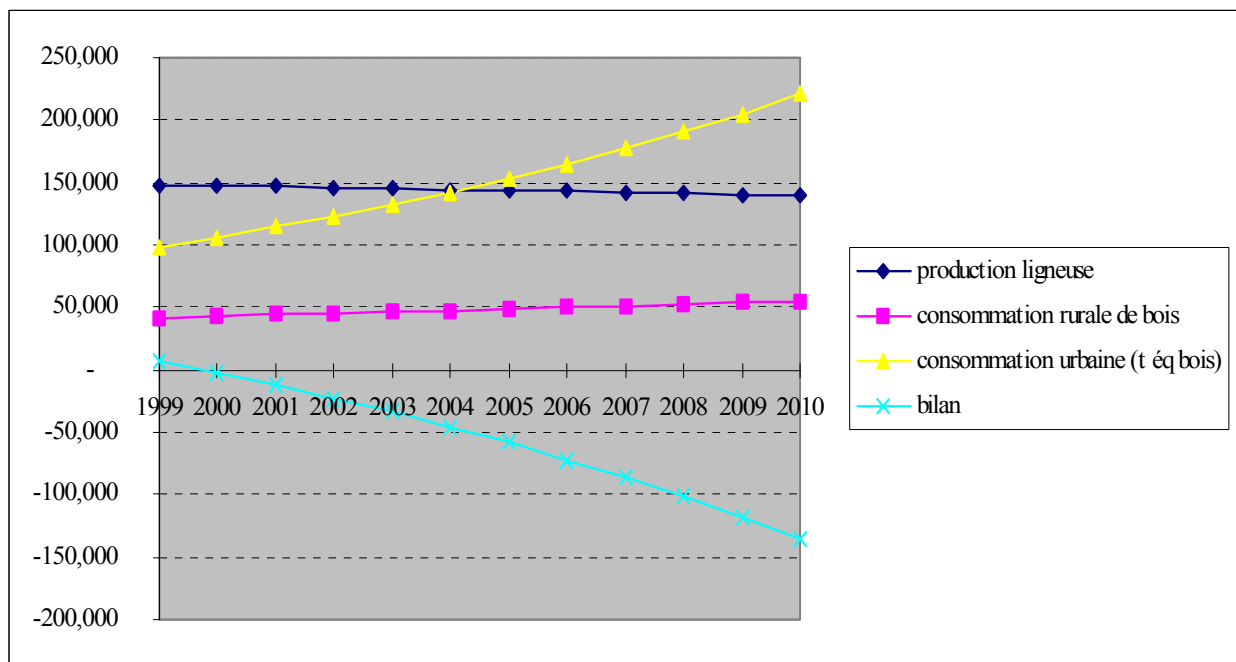


Woodfuel balance in Mahajanga catchment area (tons/year)

Including rural consumption

Source: Projet Pilote Intégré de Mahajanga, 1999

Without rural consumption



Re-interpreting the problem

- \$ Deforestation must not be viewed as a structural and fundamentally insoluble problem, but as a result of difficult but temporary mutations and adaptations between societies and the environment. If supply versus demand balances show or predict a deficit for a given area, this does not mean that this area will be completely depleted: woodfuel harvesting will become more difficult and the area will lose its competitiveness for the woodfuel dealers, who will move to further on.

Towards a sustainable woodfuel supply

Diagnosis and principles

- \$ Woody resources are a country's assets, and must therefore be valued appropriately, in the short-term as well as the long-term, in view of poverty alleviation and gender equity.
- \$ Except in very specific cases (forest or biodiversity reserves), there is no reason to exclude any area from woodfuel harvesting. Woodfuel harvesting has to be viewed as a legitimate economic activity, which is part of sustainable management of natural woodlands, even when done for commercial purposes. The woodfuel harvested areas tend to have a higher annual incremental growth (in m³ of standing wood per hectare) than those that are left untouched, since the yield is more rapid at the early stages of forest growth and gradually tapering off as the forest matures (in a fully mature, or climax, forest, the net annual increment is close to zero).
- \$ In most of African countries, woodfuel business constitutes a sector of major economic importance: in terms of employment and financial flows; incomes for thousands of people; turnovers of several millions of US\$ per year, comparable to export crops in the poorest countries, or to power or petroleum industries. One has to bear in mind that this sector has the technical and financial capacity and willingness to mutate and adapt, including how to operate sustainably under a conducive environment policy.
- \$ No country has sufficient human and financial public means to control all woodfuel harvesting activities. Regulations and fiscal systems can be developed to promote self-control of woodfuel harvesting activities.
- \$ Three principles should govern any comprehensive program aiming at a sustainable woodfuel supply: (i) to geographically redirect and rationalize the woodfuel harvesting, notably towards areas well endowed with woody resources and less environmentally fragile; (ii) to give rural people the authority to harvest woody resources located in their territory - on condition that they manage these properly; and (iii) to recognize the legitimacy of woodfuel harvesting and commercialization, and reintegrate these activities into the fiscal regime.

Proposed tools

- \$ Four main tools are proposed to ensure a sustainable woodfuel supply: (i) woodfuel supply master plan; (ii) rural woodfuel markets associated with simple forestry management plans; (iii) environmental monitoring; and (iv) regulatory and tax reform.
- \$ Woodfuel supply master plan. The woodfuel supply master plan (WSMP) of a given city concerns its economically-viable woodfuel catchment areas. It is an irreplaceable monitoring and land-planning tool useable by the policy makers at national and local levels for the re-orientation of woodfuel harvesting and the definition of forestry activities. The WSMP defines notably the geographic priorities, forms of action to implement and harvesting guidelines to respect (tree felling rules, species, quota, etc.). Rather than consisting of a rigid planning tool, the WSMP provides priorities for intervention and develops guidelines; it also provides the means to monitor progress.
- \$ The WSMP are established by combining three different readings of the woodfuel catchment area: (i) available woody resources (estimated areas, standing stocks and yields); (ii) prevailing woodfuel flows, describing the main woodfuel supply chains and localizing the main current woodfuel harvesting and charcoal-making areas; and (iii) human dynamics (history, demography and migrations, main land-consuming activities, etc.). The WSMP establishment use efficient and modern techniques, such as satellite imagery, GPS field survey, in-depth socio-economic surveys, and GIS data base and mapping.
See attached the synthesis map of the SMP for Mahajanga
- \$ Rural woodfuel market associated with simple forestry management plan. The rural woodfuel market (RWM) concept has been developed within the framework of the World Bank household energy project in Niger. The objective was to devise a self-sustaining natural woodland management system, cheap and simple enough for rural people to manage on their own, and offering such attractive benefits to local communities that they would implement it voluntarily without external support.
- \$ A RWM is a place where woodfuel dealers can buy firewood and charcoal drawn from an area of natural woodland formally delimited and agreed between the village and the neighboring ones, and the local authorities. The RWM is run by an association created at the village level, grouping woodcutters and other woody resources users. The RWM sets the selling prices of woodfuel independently. It ensures the tax collection on the basis of the delivery of permits (coupons): dealers pay for the coupons at the time of purchase.
- \$ The woodland area supplying the RWM must be managed in accordance with a simple plan agreed between the village association and the local forestry service. This includes: (i) an annual woodfuel quota designed to restrict market sales to the estimated amount which could be naturally produced on a sustainable basis; and (ii) a set of very simple

woodfuel cutting and forestry rules.

- \$ The creation of a RWM is subject to prior official agreement, upon submission of a request to the local government body designated to do so. The request is a technical document giving all the necessary information and data pertaining to the village association, the delimited woodland area and the management plan. The request could be established with the technical assistance of specialized consultancy firms. In the case of the World Bank household energy project in Mali, the consultancy firms were trained and hired by the project through a bidding procedure.
- \$ The local communities should have the free choice of: (i) the form, status and rules of the organization they create to run the RWM; and (ii) the utilization of the incomes generated by the RWM, even they are generated through the national woodfuel tax system; and (iii) choice of consultants to assist them in preparing the management plan.
- \$ Based on the experiences in Niger and Mali, the managed woodland area of a RWM ranges generally between 2,000 and 5,000 ha, and the management plan should cost no more than US\$ 20,000, i.e. less than US\$ 10 per hectare. From my knowledge, it is currently the cheapest solution for sustainable management of TDLF.
- \$ The RWM approach has proved to be sustainable. In Niger, among the hundred of RWM established during the World Bank household energy project, more than 60 were recently recorded as being in operation without any external support (five years after the termination of the project). Each of these RWM generates average annual incomes of F CFA 2 million per year (about US\$ 300,000 per year) and F CFA 200,000 per year of tax revenues, according to 1996 figures. The tax revenues have been used for building or rehabilitation of health unit, school and mosque, repairing water pumping system, vaccination campaign, etc.
- \$ Situation is likely similar in Mali, but this is the subject of another presentation.
- \$ The process of decentralization that is ongoing in most African countries is a great opportunity for TDLF management and RWM development. It will place the decision makers closer to the resource and the newly created local authorities -with their new responsibilities- will likely seek for the easiest possibilities to devolve responsibility to local partners. In addition, incomes from forest resource exploitation could play a significant role in the operating budget of rural communities. For example, numerous Communes in France in well-wooded areas, financed the building of schools and other collective building or facilities with the profits of wood sales.
- \$ Environmental monitoring. The environmental monitoring objective is mainly to draw feedback from the field on the efficiency of the proposed woody resource management methods, and adjust them accordingly. It aims also at enlightening the local authorities and rural populations about the positive impacts of a proper forestry management on the

protection of vegetation cover and water resources (in quantity and quality), and reduction of soil erosion.

- \$ Simple environmental monitoring protocols and stations have been developed in Mali and Madagascar. They were designed to ensure that rural populations can record themselves the data, after a short training. The stations should be set up in areas of particular ecological sensitivity.
- \$ Regulatory and tax reform. A reform of the forestry regulations and tax system is generally needed to enable the establishment of rural woodfuel markets. The objectives should be to provide incentives for woodfuel dealers to go to rural markets and to discourage them from obtaining their supplies from uncontrolled areas. It is based on applying differential tax rates: a low rate for the rural markets and a higher one for the uncontrolled harvesting. Arrangements have to be agreed under which tax revenues are shared between the rural markets and the various authorities involved. The proportion levied by the rural markets are paid into village funds for community expenditures.
- \$ The enforcement of the above requires a strong and efficient control system, which is doubtless the weakest element of the scheme. The control system relies generally on the checking of coupons at transport control posts set up on the main entry routes to the urban areas. Staff should be properly trained and correctly paid. In that order, the delegation of control to specialized private firms could be advantageously considered. However, over time the system will become less important and eventually obsolete when all areas are under community management.

Acting on the demand side

Diagnosis and principles

- \$ The market plays a crucial role in the development of the sector.
- \$ The introduction of attractive and competitive cooking stoves and alternative fuels in the market requires the use of modern marketing techniques and detailed analysis of market segment behavior and motivation.
- \$ Only the private sector has the capacity to develop sustainable mechanisms for the dissemination of new products, and to promote new and modern uses of woodfuel.
- \$ Four principles should govern any comprehensive program aiming at rationalizing the woodfuel demand: (i) understanding market and consumer behavior for each market segment ; (ii) providing choices for stoves and fuels, taking into account that the decision to shift to a new fuel or a new stove is an individual decision and cannot be mandated; (iii) promoting private sector investments in the household fuel area (import, manufacturing, distribution); and (iv) developing new market opportunities for woodfuel

using existing efficient urban supply chains.

Proposed tools

- \$ Price follow-up. The price history of woodfuel, kerosene, LPG and other alternative cooking fuels should regularly be followed-up by light surveys in the main cities and, for woodfuel, in the main areas of harvesting and charcoal-making. This follow-up provides crucial feedback for possible fine-tuning of the approaches pursued (identify long-term trends in interfuel substitution, seasonal or particular variations, and gives the best indications on the competition between fuels and stoves).
- \$ Permanent consumer panels. The permanent consumer panels - a fixed sample of households that regularly provide feedback - allows for understanding of consumer desires and expectations, and changes in their behavior. These panels are an indispensable tool for properly preparing marketing action and assessing their impact. The panels normally count about one hundred families per city, selected as being statistically representative of the different strata of population.
- \$ Improved stoves. The support to the dissemination of improved stoves should continue because such stoves reduce household expenditures for woodfuel, limit health risks related to smoke, and reduce the burden on women -contributing therefore to poverty alleviation and gender equity. The actions should be designed to take into account the large experience gained with marketing strategies and involvement of NGOs and the private sector.
- \$ Diversification of fuels and stoves. The diversification of fuels and stoves aims at offering a larger range of choices to consumers, in order to meet the expectations of all market segments in optimizing their household fuels mix. Direct subsidies are neither necessary nor justified.
- \$ Support to new market development. Tomorrow, kerosene, LPG and electricity will overtake woodfuels in household energy patterns, first in the cities, then in rural areas, except for ceremonial or culinary usages. This is the foretold death of woodfuel as cooking fuel.
- \$ We should make use of the existing well-structured and efficient woodfuel distribution chains, which daily demonstrate their capability to supply hundred thousands tons of charcoal and firewood to city markets, to increase employment in rural areas and provide for sustainable management of woodlands.
- \$ If one day the woodfuel market dies as suggested by my colleague, the hundred thousands tons of woodfuel, such as 130,000 to 150,000 tons for a medium size city like Niamey, could also represent a substantial energy potential for electricity generation and industrial heat, based on a renewable resource. But such new opportunities for woodfuel business will be discussed in another presentation.

Schéma Directeur d'Approvisionnement en Bois Energie

Date n°7

